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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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08/925,985 09/09/97 PATRICK

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EXAMINER

MARKOFF, A

ART UNIT

PAPER NUMBER

1743

DATE MAILED:

06/22/99

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
08/925,985

Applicant(s)
Patrick et al

Examiner
Alexander Markoff

Group Art Unit
1743



☒ Responsive to communication(s) filed on 9/9/97 - 5/7/98

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 1-24 is/are pending in the application.

Of the above, claim(s) 11-24 is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-10 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been
☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 2

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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DETAILED ACTION

Election/Restriction

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-10, drawn to a method, classified in class 438, subclass 689.
 - II. Claims 11-24, drawn to an apparatus, classified in class 156, subclass 345.
2. The inventions are distinct, each from the other because of the following reasons:

Inventions of Group I and Group II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the process as claimed can be practiced with the different apparatus, for example the apparatus wherein the surface of the sacrificial portion is not parallel to the surface of the semiconductor substrate.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

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5. During a telephone conversation with Joseph A. Nguyen on 6/14/99 a provisional election was made with preservation of the right to traverse to prosecute the invention of Group I, claims 1-10. Affirmation of this election must be made by applicant in replying to this Office action. Claims 11-24 stand withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a petition under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(I).

Drawings

7. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1-3, 7 and 10 rejected under 35 U.S.C. 102(b) as being anticipated by Nowicki (US Patent No 5,330, 607).

Nowicki teaches a method for etching of semiconductor wafers for fabricating integrated circuits. The method serves to improve the etch uniformity. See "Background of the Invention".

The method comprises placing the semiconductor wafer (13) into a sacrificial substrate holder (15); positioning the holder (15) and the wafer (13) within a plasma processing chamber (11); introducing a source gas (column 4, line 60 - column 5, line 6) and simultaneously etching the wafer and the sacrificial holder.

The sacrificial holder (15) is a ring which surrounds the wafer (Figs. 1 and 2).

The wafer in the process is in direct contact with a chuck of the chamber (25, 17).

The gaseous products of etching are pumped away (column 4, lines 32-40).

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Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103© and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

11. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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12. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nowicki (US Patent NO 5,330,607) in view of the state of the art admitted by the Applicants in the specification (page 9, lines 4-7).

Nowicki teaches a method for etching of semiconductor wafers for fabricating integrated circuits. The method serves to improve the etch uniformity. See "Background of the Invention".

The method comprises placing the semiconductor wafer (13) into a sacrificial substrate holder (15); positioning the holder (15) and the wafer (13) within a plasma processing chamber (11); introducing a source gas (column 4, line 60 - column 5, line 6) and simultaneously etching the wafer and the sacrificial holder.

The sacrificial holder (15) is a ring which surrounds the wafer (Figs. 1 and 2).

The wafer in the process is in direct contact with a chuck of the chamber (25, 17).

The gaseous products of etching are pumped away (column 4, lines 32-40).

Nowicki does not limit his method to the use in any specific plasma chamber and teaches (column 5, lines 16 -22) that the method can be practiced with many commercially available chambers.

The Applicants have admitted in the specification that inductively coupled and transformer coupled plasma processing chambers were available from commercial suppliers.

Accordingly, it would have been obvious to an ordinary artisan at the time the invention was made to practice the method of Nowicki et al in any inductively coupled plasma processing chamber (including a transformed coupled plasma processing chamber) with reasonable

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expectation of adequate results because these chambers were readily available from commercial suppliers and because Nowicki teach that his method would improve the uniformity of the plasma process and teach the use of the method in commercially available plasma chambers.

13. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nowicki (US Patent NO 5,330,607) in view of Frieser et al (US Patent No 4,350,578).

Nowicki teaches a method for etching of semiconductor wafers for fabricating integrated circuits. The method serves to improve the etch uniformity. See "Background of the Invention".

The method comprises placing the semiconductor wafer (13) into a sacrificial substrate holder (15); positioning the holder (15) and the wafer (13) within a plasma processing chamber (11); introducing a source gas (column 4, line 60 - column 5, line 6) and simultaneously etching the wafer and the sacrificial holder.

The sacrificial holder (15) is a ring which surrounds the wafer (Figs. 1 and 2).

The wafer in the process is in direct contact with a chuck of the chamber (25, 17).

The gaseous products of etching are pumped away (column 4, lines 32-40).

Nowicki does not teach the use of the sacrificial ring comprising aluminum.

Frieser et al teach a method for improving etching uniformity. The method is similar to the method of Nowicki et al. The method of Frieser et al utilizes sacrificial ring (18) and sacrificial disks (16).

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Frieser et al teach (column 2, lines 5-9) that the sacrificial ring and disks are made of the material to be etched. Frieser further teach the specific materials which can be used. These materials, among others, include tungsten (taught by Nowicki) and aluminum.

It would have been obvious to an ordinary artisan at the time the invention was made to expand the method of Nowicki on the etching of aluminum with reasonable expectation of adequate results because Frieser et al teach that sacrificial ring improves uniformity of etching of aluminum. It would have also been obvious to an ordinary artisan at the time the invention was made to make the sacrificial ring in the method of Nowicki from aluminum because Frieser et al teach that the sacrificial ring should be made from the material to be etched.

14. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nowicki (US Patent NO 5,330,607) in view of Frieser et al (US Patent No 4,350,578) as it applied to claim 4 above, further in view of Grill (Cold Plasma in Material Fabrication (pages 86-113 and 216-245).

Nowicki modified by the teaching of Frieser et al teach (as it has been shown above) teaches the claimed method except a reactive gas comprising chlorine (claims 5-6) and conducting the method in an inductively coupled plasma processing chamber (claim 6).

As to claims 5 and 6:

Frieser et al also teach the use of the mixture $\text{SF}_6/\text{CCl}_4/\text{He}$ as a reactive gas. This mixture includes chlorine atoms. An ordinary artisan at the time the invention was made would have

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reasonably expected that this mixture would etch all the materials taught by Frieser et al. Moreover, since Frieser et al do not specifically state that this mixture can be used for etching of aluminum, Grill is cited to support the Examiner's position. Grill explicitly teaches that conventional gases for etching aluminum comprise chlorine. See Table 8-2 on page 231.

Having the combined teaching of Nowicki, Frieser et al and Grill, it would have been obvious to an ordinary artisan at the time the invention was made to a reactive gas comprising chlorine to etch aluminum in the modified method of Nowicki because such gases were conventional for etching aluminum.

As to claim 6:

Nowicki does not limit his method to the use in any specific plasma chamber and teaches (column 5, lines 16 -22) that the method can be practiced with many commercially available chambers.

Grill that inductively coupled plasma processing chambers were conventional in the art for reactive ion etching and available from commercial suppliers (paragraphs 4.3.3; 4.4-4.6).

Accordingly, it would have been obvious to an ordinary artisan at the time the invention was made to practice the method of Nowicki et al in any inductively coupled plasma processing chamber with reasonable expectation of adequate results because these chambers were readily available from commercial suppliers and because Nowicki teach that his method would improve

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the uniformity of the plasma process and teach the use of the method in commercially available plasma chambers.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Celestino et al (US Patent No 4,579,618), Stark et al (US Patent No 4, 786,359), Erskine et al (US Patent No 5,262,029) and Sherstinsky et al (US Patent No 5,673,922) are cited to show the state of the prior art with respect to the use of sacrificial, supporting, clumping and focus rings in plasma processing methods.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Markoff (Art Unit 1743) whose telephone number is (703) 308-7545.

When filing a FAX in Technology Center 1700, please indicate in the Header (upper right) "Official" for papers that are to be entered into the file, and "Unofficial" for draft

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documents and other communications with the PTO that are not for entry into the file of the application. This will expedite processing of your papers.

The fax phone number for "official" faxes is (703) 305-7718.

The fax phone number for "unofficial" faxes is (703) 305-7719.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0651.

am

June 16, 1999

Alexander MARUOFF
Patent Examiner
Art unit 1743